Designing novel interactional workspaces to support face to face consultations

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Designing novel interactional workspaces to support face to face consultations

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ABSTRACT

This paper describes the design and deployment of a novel interactional workspace, intended to provide more effective support for face-to-face consultations between two parties. We focus on the initial consultations between customer and agent that take place during the development of complex products. Findings from an ethnographic study of the existing use of technological systems show the interaction during such consultations to be disjointed and not well supported. As an alternative approach, we developed a novel arrangement of multiple displays intended to promote shoulder-to-shoulder collaboration using a variety of interlinked representations and visualizations. The resulting interactional workspace was used by a travel company as part of a large international trade show attended by the general public. The many consultations that took place between agents and customers were quite different, proving to be more equitable, open, fluid and congenial.

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INTRODUCTION

Web-based and e-commerce models of interaction have dominated the ways in which we see technology supporting sales. The most successful of these are those that focus on high volume sales, where transactions are short, single-session, straightforward and well understood (e.g. the on-line purchasing of books, flowers, software, cheap flights and hotel rooms). Interaction has been optimized for efficient transactions making it relatively simple for the customer to make purchases (e.g. the one-click™ function developed by Amazon).

The success of these sites is often not reflected by those that try to sell high-value, complex products (e.g. hi-fi systems, insurance portfolios, fitted kitchens or digital TV packages) that are custom-designed and difficult to deliver at first contact: they need to be configured and personalized, and this takes a long time, and a multitude of careful decisions between competing options. Understandably, customers are very reluctant to purchase such products online and instead continue to buy them via a 'bricks-and-mortar' method; seeking trustworthy personal advice from, and making their choices together with, another physically present human being.

We take as our starting point the face-to-face consultation central to these kinds of sales transactions. To this end, we undertook an ethnographic study of interactions and processes involved in current face-to-face sales transactions. We found problems in the way informational resources were presented and used during the transaction. We also discovered that the physical placement of technologies often hindered collaboration. Based on our analysis, we (i) designed and built a novel arrangement of displays which, in conjunction with the software we developed, could more effectively integrate the multiple information resources used; and (ii) developed various computational tools that would make the transaction process more fluid and easy to manage.

In addition to substantially changing the way information can be accessed, visualized and interacted with, we also explored how the physical design of a setting could change the nature of the collaboration between two parties when in a face-to-face setting. We built a customized interactional workspace containing shared displays that allowed 'side-by-side' and 'shoulder-to-shoulder' collaborations [15].

To test the resulting workspace, we placed it in a real-world context, namely, an international travel show, where a broad cross-section of the general public used it in collaboration with different sales agents to undertake preliminary consultations. We discuss the findings of this

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study in terms of the benefits that can be obtained from designing novel kinds of interactional workspaces. We also discuss how this approach can be used to extend existing e-commerce models.

SUPPORTING FACE TO FACE CONSULTATION

Although several significant e-commerce successes have been reported in the literature, a number of studies have found that a large proportion of the general public are still reluctant to buy products via the web. Various reasons for this have been put forward, including security and trust [7]; the consequences of failure [1] and the difficulty of making rational, informed choices online without the ability to discuss it with someone else [12].

The type of product has been suggested as a key-determining factor. Whereas people are willing to buy 'objective' products online, like books and software, they find it much more difficult to make rational, informed decisions about more 'subjective' products (like fashion clothing) that need other's opinions and approval [12]. We would argue that complex products that are usually developed with a consultant, like a new kitchen or a financial portfolio, are susceptible to the same types of resistances. However, crucially, such products require collaboration between a salesperson and the customer.

At the same time a number of studies have shown that the role of technology in face-to-face consultations can be problematic. For example, studies in the banking sector [6] and medical consultation [5] have suggested that the physical layout of technology can inhibit the interactions between the parties involved. An all too familiar situation is one where the 'consultant' (e.g. agent, doctor, receptionist) sits behind one side of a desk, retrieving and displaying information on their PC, with the other party marooned on the other side, staring at the back of the computer. The arrangement has the effect of restricting access to information primarily to the person in front of the computer and in so doing making it difficult for the other person to become engaged in the collaboration, even if both parties are willing [11].

To overcome these problems Luff and Jirotka [8] suggest a number of design implications for future technologies based on how co-located groups use everyday interactional resources to coordinate their collaborative and social activities. The notion of Single Display Groupware (SDG) has also been promoted as a way of designing applications to support co-located groups [13]. It proposes developing applications to appear on a large display which allows more than one person to interact with them. For example, Streitz constructed the InteracTable [14] as a shared digital table for office workers. More recently, DiamondTouch developed by MERL [2] provides a shared interactive tabletop which can recognize touch input from multiple users.

Recent studies have also suggested clear benefits of having information appear on more than one display for individual users [3, 4]. These include helping users to keep track of, and manage, multiple tasks, for example, placing core tasks on a central screen with less important tasks and associated information on peripheral displays. There has been no research, however, investigating how co-located groups may accrue similar benefits when using multiple interlinked displays to support their collaborative activities.

The goal of our research is to augment face-to-face consultations through the development of interactional workspaces that combine SDG's support for cooperation with the advantages of task demarcation and partitioning enabled by multiple displays.

UNDERSTANDING FACE TO FACE CONSULTATIONS

Sales-based transactions focus on the creation of complex products often over multiple sessions using a diversity of resources. The specification of the product is central to the transaction but at the outset neither the customer nor the salesperson typically has a clear idea of what the customer really wants, and hence what the outcome might be. To determine the nature of the product, much discussion, negotiation and 'fleshing out' needs to be carried out, especially early on, and various alternatives have to be weighed up, together with the trade-offs involved in including certain options and not others.

Specifying complex products involves the use of a wide range of information resources, including online booking systems, brochures, websites and promotional materials, as well as the knowledge of the salesperson and the expectations of the customer. These need to be coordinated for face-to-face consultations to go smoothly, but this is often difficult to achieve. Confusion, misunderstanding and the need for repair work can often arise.

To more fully understand the nature of the problems involved in face-to-face consultations we carried out a detailed six-month ethnography, observing and video-recording a number of different sales-based transactions that took place at various travel companies, following the different stages involved in building a round-the-world trip. We also interviewed customers and agents about their strategies and the problems they encountered. Here, we present some of our key findings of what happens during the beginning stages of a transaction, which is where most problems arise. We focus on how customer and agent interact physically during initial face-to-face consultations, and the information representations that are used. A key problem we identified was that there is much asymmetry which affects the extent to which the two parties can effectively collaborate.

The asymmetrical nature of support

The technological set-up in a travel agency is designed primarily to support the salesperson to do their job, and not the customer. This asymmetry is manifested in the physical arrangement of devices and the representations available to each party.

Physical asymmetry

In all the travel agencies we visited, the PC was positioned in front of the agent, who uses it to do their tasks, like

looking up flight availability or special offers, and filling in booking forms. The software applications that are used are also solely aimed at the agent, to enable them to find out about products (e.g. flights, hotels) and to produce bookings. In contrast, the informational resources available to the customer are primarily paper-based, in the form of glossy brochures and flyers.

When the customer first enters a travel agency, they have to sit on the opposite side of the agent's desk, largely unable to see what the agent is doing or what is appearing on their screen, unless they peer over or the agent swivels the computer monitor around for them to see. The default mode of interaction is for the agent to talk to the customer around the PC monitor and only occasionally turn their screen towards the customer.

Figure 1 The arrangment of technology at a travel agency

Figure 1 shows a common scenario – the agent immersed in a world of information they are querying as part of the consultation, which the customer cannot see. This has three effects:

- The arrangement is socially awkward with the technology setting up a barrier to collaboration.
- Time is spent when the customer is waiting doing nothing, and is not being communicated with by the agent.
- The agent has to translate everything into a verbal form for the customer to understand what is going on.

This means that the content of the consultation – a round the world trip – is hard to 'see': it tends to be something imagined on the basis of talk – and of course, the customer has to remember the information from moment to moment, and with a complex product can easily get lost. This issue is compounded by the numerous representations used.

Representational asymmetry

Much of the initial transactional process involves accessing and making decisions about certain kinds of information (e.g. flights, hotels, dates, cost) presented as a series of separate representations. Some of these, notably brochures, are specifically for customers to use while they work up an initial plan. Others, including online booking forms and product databases, can, in contrast, only be accessed, understood and operated by agents, and must be used to translate the customer's ideas into a quote.

What this means in practice, is that much of the interaction that takes place during a transaction involves translating representations between the agent and customer. On the one hand, customer-geared representations (e.g. brochure information about hotels, dates, prices and restrictions) need to be translated into a form that the agent can work with when interacting with the various computer-based systems, and on the other, system-based representations have to be translated into a form that customers can understand.

Hence, it is not surprising to find the representations that are created by the agent and customers during the transaction are also quite different. For example, the customer's way of initially representing their proposed *plan* is chronologically, in terms of when and how long they want to spend at a place. In contrast, the agent needs to represent the customer's plan as an *itinerary*, which has to be formatted in terms of 'product types', according to the order different products can be booked (typically flights are booked first, followed by hotels, followed by other 'land sales' like hire cars or tours). This requirement is always implicit, so customers may, despite writing down a detailed plan, produce something that requires much working up by the agent.

Design Implications

These observations point to a number of difficulties that customers and agents currently need to contend with. The design of new interactional workspaces could improve these by:

- *Reducing physical asymmetry* by configuring the orientation of displays to promote cooperation at the core of the consultation.
- *Reducing representational asymmetry* by providing shared informational resources that both customer and agent can refer to and make sense of.

The design would need to promote the joint planning and exploration of the product and support better integration of the different representations used by both parties to build up a product. In so doing, it could open up new possibilities for exploring the creation of a product by providing (i) the ability to create and visualize a number of alternative itineraries and (ii) ways of visually exploring different product possibilities and alternatives within each itinerary. The proposed benefits of our design recommendations include:

- Empowering the customer, by enabling them to take a more active part in the initial stages of planning.
- Reducing social awkwardness, through designing better physical and technological arrangements and enhancing camaraderie between customer and agent.
- Reducing translation costs and, in so doing, the cognitive effort required to understand and develop a product.
- Enabling the customer and agent to plan synchronously and in a complementary way.

• Providing, through the use of computational offloading [10], a richer, more detailed set of possibilities and permutations to be explored.

DESIGNING A NEW INTERACTIONAL WORKSPACE

To begin with, we considered ways of reducing the physical asymmetry inherent in the current arrangement of technologies. We undertook this through:

1 Altering the physical arrangement of the technology to allow more equitable access to information by both parties.

2 Providing different seating/standing arrangements to allow the customer and agent to sit or stand side by side rather than opposite each other.

Specifically, we were interested in designing a new workspace that both parties could use to view displayed information together, and to work shoulder-to-shoulder.

Having gone through a few design iterations we decided on an arrangement called the 'eTable'. This was designed like a console, providing three integrated large flat 21-inch displays set at 1280 x 1024 resolution, two horizontal and one vertical, embedded in an oval table 1.5m long and 1m wide (see Figure 2). In earlier studies, we had found that although single horizontal large-screen displays afford improved collaboration when compared to huddling around a single workstation, there were problems with size and placement of windows, which could alter or even overlap. At the same time, shoulder-to-shoulder collaboration was difficult because the top of the display was too far away and at too low a resolution.

We decided that smaller multiple screens with higher resolution would be more readable by a seated group, and that being able to sit side by side would also support passing of input devices thus facilitating interaction by both users. At the same time, this decision follows work on use of multiple displays [3], which enables individuals to structure their work by allocating fixed positions to given displays that do not need to be moved in order to be attended to; rather attention is allocated through glancing, which is more seamless and less likely to break concentration. Moreover we assumed that the spatially fixed presentation of various information representations would help with 'dynalinking', i.e. integration of different representations [10]. This would allow users to maintain a more complex picture of the connections between the various pieces of information than if presented jumbled up in a single window.

Another advantage this arrangement offers over a large single-screen display is privacy. The design of the eTable console enabled only those seated or standing near it to be able to see the information and itineraries unfold on the two horizontal displays; an important consideration for use in a public space.

The version of the eTable shown in Figure 2 was designed as an oval shape, so that when the customer (this can be one or more) and agent sit in front of it they can more easily see each other and make eye contact. Sufficient surface space was also provided for a wireless mouse and keyboard together with room for placing other materials.

Figure 2 The eTable console with interlinked displays

In conjunction with designing a new physical workspace, we also sought to reduce representational asymmetry by developing information visualizations that were intended to be easily understandable and used as shared referents by both parties. They were designed, in addition, to reduce the cognitive effort required when building up a product, including performing various computations (e.g. working out the cost of adding or subtracting items to/from an itinerary). The intention was to enable the agent and customer to more easily and rapidly compare the costs, and other results, of working out different itineraries. We also developed an interactive planning tool that was highly visual and exploited direct manipulation interaction, allowing the agent to build up a product in ways not possible with existing 'verbal' means. In so doing, it was hoped that one of the benefits would be to reduce the translation costs. The representations used to create an itinerary were designed to be put together in a number of ways, including matching the way the agents were used to working (via specifying products according to booking order) and matching the chronological ordering that customers use when planning.

The interactive representations were designed to be presented on the different displays of the eTable console, in a contextually 'dynalinked' way [9]. For example, the interactive planner tool is presented on the left hand display and the effects of making certain choices in terms of time and cost are shown on the right hand display (see Figure 3 overleaf), synchronously updating in appropriate ways.

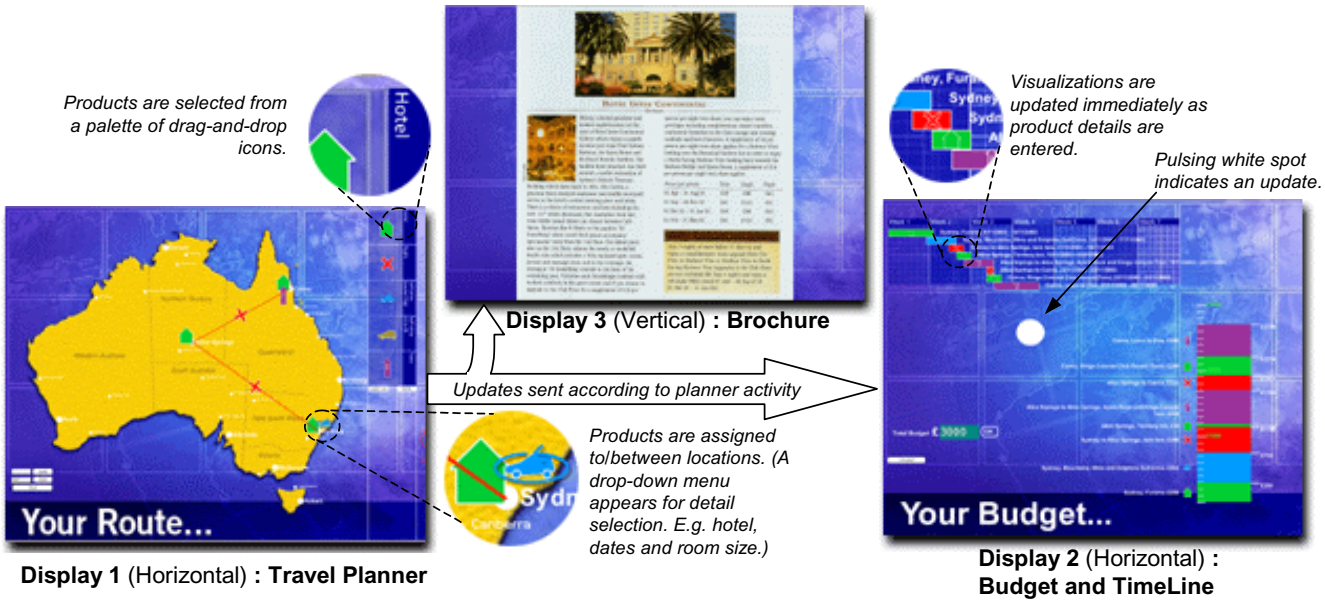

Figure 3 Screen shots of the three displays from the eTable prototype showing the itinerary unfolding

The interactive planner (screen 1) provides a palette of 'product' icons (planes, trains, hotels) which can be dragged onto an interactive map (such as Australia, as shown) which is then iteratively built up. For example, a hotel can be placed on a destination and this creates a dropdown menu with all the hotels available in that location. Selecting a menu item triggers a relevant page from the online brochure, which appears on screen 3. At the same time interactive 'flyouts' (calendar, room type) pop up, overlaying the planner, and providing entry points for selection of various options (e.g. number of nights). After a hotel is specified in terms of the dates, room type and number of nights, the visualizations on screen 2 are updated. A flashing white circle initially pops up on screen 2 to attract the attention of the agent and customer to view these updates. Other products (flights, tours, car hire) can be added in the same way.

The two visualizations were designed as 'computational offloaders': showing dynamically-updated graphical representations of the amount of budget spent so far and the segments of the itinerary being built up, using, respectively, a 'barometer' representation and a time-line. These computations require considerable effort to accomplish by a human, especially when multiple components are being added or subtracted. Instead the visualizations show effects on budget and time, without either the agent or the customer having to work it out in their heads or on a bit of paper. Furthermore, the agent and customer, at a glance, can see how much is being spent, without ever having to explicitly refer to it. This can help overcome some of the social awkwardness experienced by customers, reducing the need for them to have to ask 'how much will that add on?' or 'have I gone over my budget yet?'.

DEPLOYING THE SYSTEM IN A REAL-LIFE SETTING

We wanted to evaluate our system in an authentic setting, where real customers and agents could use it to explore and build up potential round the world trips. We were given an opportunity, by the travel company we have been working closely with, to try out our new system at a large international travel trade show. The show was based in a large exhibition center and lasted four days, having a throughput of many thousands of people, drawn from the general public and the travel business. The travel company was very concerned that our system appear professional on their stand and have the right look-and-feel and branding associated with the company (a specialist in Australian travel and purpose-built tours). Hence, we let them set it up. They positioned it on the corner of their stand and embellished it with a large koala bear, piles of their travel brochures, posters and a vase of flowers. The effect was to make it an eye-catching showpiece (see Figure 4).

The form of 'window dressing' designed by our travel agents proved to be very effective. All manner of people were attracted to the stand, including single business men/women, families, young and old people, couples and groups of friends, and disabled people (e.g. a deaf couple). Over the four days, about 100 different groupings actually interacted with the system alongside a trained sales agent, who assisted them. Sometimes the system was left to run unattended by staff and members of the public tried experimenting with it by themselves.

The wow factor

The agents were initially trained by us as to how to use the system functionality and interact with the different representations. They quickly saw its potential in the context of their work (many not having seen or heard of it before); and were especially impressed by the interlinking

of pages from the online brochures, the visual approach to building up an itinerary using the planner, and being able to see the results of doing so dynamically appearing on the linked visualizations.

Figure 4 the eTable in use at a travel trade show

The people who approached the travel company stand were immediately drawn to our system. Customers would first watch others using it, and then wait to have a go themselves. There was no need to convince them to use it. The agents would invite them to sit or stand in front of the system and then ask them where they would like to go. The prototype we had running allowed various trips around Australia to be built up, providing plenty of scope for working out different itineraries. In general, each person/group and agent spent between 5 and 10 minutes working together, although some interactions lasted up to 30 minutes. Most were very impressed by the system and several rival travel companies came over to see what all the fuss was about. Moreover, many of the interactions resulted in complex itineraries being created and, in some cases, resulted in the passer-by handing over details to make an actual booking and in so doing becoming a customer.

One unexpected outcome was how interacting with the visual planner brought aspects of the vacation alive – almost like providing a vicarious experience. The agents often gestured to parts of the display to describe what could be done in a particular place, how enjoyable a given activity was, why it was better to travel by train rather than car for a given stretch and so on. The customer would also gesture to various parts of the map whilst talking through a possible plan, indicating that they had been there already or they wanted to go to that part.

Although, the same effect, arguably, could be achieved through providing a paper-based map and brochures for both to refer to, having a dynamic map that could be zoomed in and out of, and an itinerary with costs superimposed on it, together with showing interlinked contextualized brochure pages of activities, provided a more congenial multimedia space, that encouraged both parties to talk about places in a more experiential way.

Below, we discuss the findings in more detail in relation to our anticipated benefits outlined in the design implications.

Empowering the customer

Customers generally took an active role in specifying the components of an itinerary, suggesting different types of products (e.g. hotels, wine-tasting tours), and were interested in seeing how these affected their overall budget and plan. Conversation flowed freely and the agents often responded to the suggestions and requests put forward by the customer, reflecting less asymmetry and more sharing in the planning process. The customer frequently gestured towards information on the different screens when listening or talking and on some occasions took hold of the mouse to select options themselves. For example, a child of six sat down at the console, while his parents looked over his shoulder. No agent was present and the child started using it alone, treating it very much like a computer game, trying to 'break' the budget he'd previously set, by configuring a holiday that greatly exceeded it. He then started joining up all the destinations on the map, by placing plane icons on each of the cities and dragging them to the next city – a playfulness in interaction we had not expected. During the child's play, the parents got drawn into the possibilities of traveling around Australia to the extent they went off to talk to a sales agent about a possible vacation.

The technology was also empowering in that it could be appropriated by various (potentially excluded) parties to match their needs. For example, on discovering that one couple was deaf, the agent made much more of the interactive planner and visualizations, gesturing and pointing to the changes on the screen, as if to let the representations 'speak' for themselves. The couple, meanwhile, nodded and reciprocated in gesturing at the screens, and even pointed to the mouse when they wished to interact with the visualizations. Such an *ad hoc* way of using the system provided a novel way of visually communicating.

Reducing social awkwardness and enhancing camaraderie

The physical design of the console table enabled the agent and customer to sit down and interact together in relative comfort. Moreover it seemed that our table was able to reduce some of the social awkwardness that arises when two strangers first meet. Enabling them to sit side by side meant that there was less of an expectation for direct eye contact. Instead, attention was focused on the displays in front of them. This allowed the two parties to talk about what was happening on the screens, rather than having to look directly at each other, which is what often makes strangers feel uncomfortable. At the same time the shared representations reduced the need for agents to leave customers alone in order to concentrate on screens, to have to translate what they were doing, and for the customer to have to ask for clarification – all creators of social awkwardness. The effect was to create a much more congenial and less formal set-up than the initial encounters we had observed that take place in travel agents. Customers seemed to quickly settle down and feel relaxed (as indicated by their body postures and manner of talking).

We also observed evidence of continuous rather than interrupted interaction, where both parties played a more equal role and interaction was more free-flowing. There was much joking and high spirits between the two parties, conveying a lightheartedness that helped the two parties collaborate. When asked afterwards, many of the agents commented on how much easier they had found it to build up a rapport with the customer.

Reducing cognitive effort

Having multiple displays helped the parties focus and attend to the information in front of them in appropriate ways. The agents rapidly learnt which screens to look at next (such as looking at screen 3, after making a selection for a hotel in the planner pop-up calendar dialog box in screen 1) and guided the customer in their navigation through the displays, through changing their gaze or pointing. The customer also quickly learnt to associate the effects of carrying out an interaction in one screen with another, turning their attention to the changes occurring in the budget and time visualizations following the addition or subtraction of a component to the planner. The linked visualizations and shared representations helped both parties keep better track of how the product was developing, through reducing cognitive load [10].

Enabling synchronous and complementary planning

Collaboration between agent and customer tended to be very fluid in nature. While the agent predominantly controlled the interaction with the system, the customers often made suggestions as to what to do next. For example, they might suggest to try another kind of hotel or go on a sightseeing tour of Sydney. Hence, there was evidence of joint planning, where the person 'driving' the system would effectively hand over control of the planning to the customer, and then take it back again to show another suggestion. Thus the physical design helped reduce the physical asymmetry we saw in the current arrangement.

Exploring more possibilities and permutations

Preliminary itineraries were in most cases created relatively quickly and easily. This encouraged the agent and client to explore a range of possibilities, enabling them to compare having different ordering of locations, choice of activities and ways of traveling around Australia. Having a rich set of possibilities is very useful later in the transaction where substitutions may need to be made because of booking issues. It also helps the customer make more of an informed choice.

DISCUSSION AND CONCLUSIONS

This paper has shown that the design, development and deployment of a novel interactional workspace can facilitate new forms of working between customers and agents in consultation. The workspace is a product of a design that considers both the physical arrangement of the displays and the interactive software. The outcome of doing so makes building up a complex product during face-to-face consultations more effective, enjoyable and equitable. A number of factors may have been responsible for producing these positive effects, including the sheer novelty of the system. Hence, it is difficult to actually pinpoint what were the specific causes of our findings, or their possible interactions. In general, though, our results suggest that two party transactions can be improved significantly by providing alternative workspaces. In particular, changing the physical set-up and providing integrated representations:

- Allows people to refer to the same graphical representations, making it easier for both parties to take turns in developing a product.
- Couples the creation of a product with the dynamic display of relevant information, enabling the consultation process to be more fluid.
- Partitions the information across screens, allowing multiple parameters and complex relations to be followed and more readily interpreted.
- Provides dynamically linked external representations of the dependencies between different parameters, enabling a broad range of alternatives to be explored and compared.
- Enables different types of information to be mapped to particular displays helping guide people's attention to where to look at a given stage of the consultation.

The net effect is to enable both parties to more effectively integrate the disparate kinds of information and representations needed during planning. In so doing, it allows for more equitable sharing of the work when developing a product, enhanced product specification and improved cognitive and social aspects of the transaction.

We have shown how substantial improvements can be made by more effectively supporting the interactions and collaborations that occur when agents and customers are co-located. How might we extend this practice even further, and consider how we can support collaboration between customer and agent when they are not co-present? One approach is to consider how to develop 'satellite' workspaces that branch out from the core face-to-face setting. For example, we are currently developing ways of supporting later stages of the transaction, where a customer is able to explore a partially completed set of itineraries in the comfort of their home with their family or friends.

The distributed architecture we developed to link the co-located screens also allow us to save the itineraries on a server which can then be accessed via the internet at a later time. A key design concern is how to map and interlink the interactive information onto the screens available at a particular setting for both customer and agent. For example, if a customer has a PDA and a PC available then brochure information can be shown on a PDA screen, while the interactive planner could appear on a PC. If they only have a single PC then a limited view designed for browsing their current itinerary can be provided.

We are currently extending the interactional workspace by providing additional displays for different purposes. For

example, we have added a large projected display which makes a series of associated images and video clips more publicly available as a means of drawing in new customers. We are also exploring the use of a portable wireless laptop to provide the necessary product specific information for more private perusal by the agent.

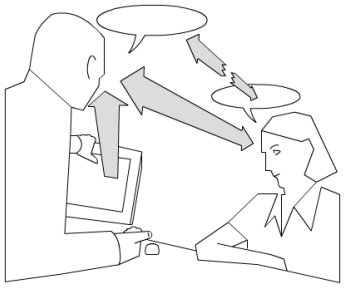

Figure 5a Current face-to-face consultation model, where the person using the computer has to translate the screen-based information to the other in a verbal form. This can take much time and effort.

Figure 5b An alternative shared interactional workspace, with multiple linked displays, supporting shoulder-to-shoulder interactions. It provides a shared reference that can help reduce social awkwardness and improve coordination.

Finally, it is worth reflecting that the use of a single display (see Figure 5a) is still very much the predominant interactional paradigm. Clearly, there are work settings where such a 'restricted' arrangement is appropriate, especially where the person with access to the computer may need to withhold information from the other person. However, our research has shown that there are other work settings, where widening the access to information in a workspace to both parties can substantially improve collaboration and coordination (see Figure 5b). To this end, we argue that there is considerable scope for developing other kinds of more accessible interactional spaces, using multiple linked displays and representations.

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